

Claims

1.

1           A fastener assembly adapted for providing adjustment between at least two  
2        members, said fastener assembly including:

3           a bolt having a head, a shank axially extending from said head, and a  
4        circumferentially uninterrupted threaded portion axially extending from said shank;

5           a first cam washer fixed against rotation to said shank of said bolt adjacent said  
6        head of said bolt; and

7           a second cam washer fixed against rotation to said shank of said bolt adjacent said  
8        threaded portion of said bolt.

2.

1           The fastener assembly set forth in claim 1 further including a nut adapted for  
2        attachment to said threaded portion of said bolt.

3.

1           The fastener assembly set forth in claim 2 wherein said nut includes a threaded  
2        portion and a skirt portion extending from said threaded portion, said threaded portion adapted  
3        for threading to said threaded portion of said bolt after said second cam washer is at least  
4        partially fixed to said shank, thereby preventing the possibility of said second cam washer  
5        becoming misassembled to said bolt between said shank and said nut.

4.

1                   The fastener assembly set forth in claim 3 wherein said skirt portion of said nut  
2                   has a length equal to the length of said threaded portion of said bolt minus the thickness of said  
3                   second cam washer, plus two times the thread pitch of said threaded portion of said bolt.

5.

1                   The fastener assembly set forth in claim 1 wherein said threaded portion of said  
2                   bolt is circumferentially uninterrupted over substantially the entire length of said threaded  
3                   portion.

6.

1                   The fastener assembly set forth in claim 5 wherein said threaded portion does not  
2                   include any axially-extending circumferential interruptions.

7.

1                   The fastener assembly set forth in claim 1 wherein said shank of said bolt includes  
2                   at least one key feature and said second cam washer includes an aperture adapted for freely  
3                   passing over said threaded portion of said bolt and further includes at least one key feature  
4                   corresponding to said at least one key feature of said bolt, thereby fixing said second cam washer  
5                   to said shank of said bolt against rotation with respect thereto.

8.

1                   The fastener assembly set forth in claim 7, wherein said at least one key feature  
2                   of said bolt is integrally formed into said shank of said bolt during production of said bolt.

9.

1           The fastener assembly set forth in claim 8 wherein said at least one key feature  
2        of said bolt includes at least one flat and said aperture of said second cam washer is defined by  
3        at least one corresponding flat.

10.

1           The fastener assembly set forth in claim 9 wherein said at least one flat includes  
2        at least two adjacent flats.

11.

1           The fastener assembly set forth in claim 10 wherein said at least two adjacent flats  
2        includes an incomplete hexagon in cross section.

12.

1           The fastener assembly set forth in claim 11 wherein said incomplete hexagon in  
2        cross section includes four of six sides.

13.

1           The fastener assembly set forth in claim 1 wherein said at least one key feature  
2        of said bolt extends axially from said threaded portion for a length adapted to accommodate a  
3        variety of widths of said at least two members.

13

14.

1           The fastener assembly set forth in claim 1 wherein said threaded portion of said  
2        bolt is diametrically smaller than said shank of said bolt to facilitate said second cam washer to  
3        pass freely thereover and engage said at least one key feature of said shank.

15.

1           The fastener assembly set forth in claim 1 wherein said first cam washer is splined  
2        to said bolt.

16.

1           A cam bolt assembly adapted for providing adjustment between at least two  
2        members of an automotive suspension linkage, said cam bolt assembly including:  
3                a bolt having a head, an enlarged diameter portion axially adjacent said head, a  
4        shank extending axially from said enlarged diameter portion, and a substantially uninterrupted  
5        threaded portion extending axially from said shank, said shank having at least one key feature;  
6                a first cam washer mounted to said enlarged diameter portion of said bolt;  
7                a second cam washer mounted to said shank of said bolt in engagement with said  
8        at least one key feature, said second cam washer having an aperture therethrough that  
9        substantially corresponds in shape to said at least one key feature of said shank; and  
10                a nut adapted for attachment to said threaded portion of said bolt, said nut  
11        including a threaded portion and a skirt portion extending from said threaded portion, said  
12        threaded portion being adapted for threading to said threaded portion of said bolt after said  
13        second cam washer is at least partially engaged with said at least one key feature, thereby

14 preventing the possibility of said second cam washer becoming misassembled to said bolt  
15 between said shank and said nut.

17.

1 The cam bolt assembly set forth in claim 16 wherein said at least one key feature  
2 on said bolt and said aperture in said second cam washer are such that said second cam washer  
3 can be assembled to said bolt at only one angular orientation of said second cam washer to said  
4 bolt.

18.

1 The cam bolt assembly set forth in claim 17 wherein said skirt portion of said nut  
2 has a length equal to the length of said threaded portion of said bolt minus the thickness of said  
3 second cam washer, plus two times the thread pitch of said threaded portion of said bolt.

19.

1 The cam bolt assembly set forth in claim 16 wherein said threaded portion of said  
2 bolt is circumferentially uninterrupted over substantially the entire length of said threaded  
3 portion.

20.

1 The cam bolt assembly set forth in claim 19 wherein said threaded portion does  
2 not include any axially-extending circumferential interruptions such as grooves or flats.

21.

1        The cam bolt assembly set forth in claim 16, wherein said at least one key feature  
2        of said bolt is integrally formed into said shank of said bolt during cold forming of said bolt.

22.

1        The cam bolt assembly set forth in claim 21 wherein said at least one key feature  
2        of said bolt includes at least one flat and said aperture of said second cam washer is defined by  
3        at least one corresponding flat.

23.

1        The cam bolt assembly set forth in claim 22 wherein said at least one flat includes  
2        at least two adjacent flats.

24.

1        The cam bolt assembly set forth in claim 23 wherein said at least two adjacent  
2        flats includes an incomplete hexagon in cross section.

25.

1        The cam bolt assembly set forth in claim 24 wherein said incomplete hexagon in  
2        cross section includes four of six sides.

26.

1           The cam bolt assembly set forth in claim 16 wherein said at least one key feature  
2        of said bolt extends axially from said threaded portion for a length adapted to accommodate a  
3        variety of widths of said at least two members.

27.

1           The cam bolt assembly set forth in claim 16 wherein said threaded portion of said  
2        bolt is diametrically smaller than said shank of said bolt to facilitate said second cam washer to  
3        pass freely thereover and engage said at least one key feature of said shank.

28.

1           An automotive suspension linkage including:  
2           a first member;  
3           a second member linked to said first member; and  
4           a cam bolt assembly linking said first and second members, said cam bolt  
5        assembly including:  
6           a bolt having a head, an enlarged diameter portion axially adjacent said  
7        head, a shank extending axially from said enlarged diameter portion, and a substantially  
8        uninterrupted threaded portion extending axially from said shank, said shank having at least one  
9        key feature;  
10           a first cam washer mounted to said enlarged diameter portion of said bolt;  
11           a second cam washer mounted to said shank of said bolt in engagement  
12        with said at least one key feature, said second cam washer having an aperture therethrough that  
13        substantially corresponds in shape to said at least one key feature of said shank; and

a nut adapted for attachment to said threaded portion of said bolt.

29.

1                   The automotive suspension linkage set forth in claim 28 wherein said nut includes  
2                   a threaded portion and a skirt portion extending from said threaded portion, said threaded portion  
3                   adapted for threading to said threaded portion of said bolt after said second cam washer is at least  
4                   partially engaged with said at least one key feature, thereby preventing the possibility of said  
5                   second cam washer becoming misassembled to said bolt between said shank and said nut.

30.

1                   The automotive suspension linkage set forth in claim 29 wherein said skirt portion  
2                   of said nut has a length equal to the length of said threaded portion of said bolt minus the  
3                   thickness of said second cam washer, plus two times the thread pitch of said threaded portion of  
4                   said bolt.

31.

1                   The automotive suspension linkage set forth in claim 28 wherein said threaded  
2                   portion of said bolt is circumferentially uninterrupted over substantially the entire length of said  
3                   threaded portion.

32.

1                   The automotive suspension linkage set forth in claim 31 wherein said threaded  
2                   portion does not include any axially-extending circumferential interruptions such as grooves, or  
3                   flats.

33.

1                   The automotive suspension linkage set forth in claim 28, wherein said at least one  
2                   key feature of said bolt is integrally formed into said shank of said bolt during cold forming of  
3                   said bolt.

34.

1                   The automotive suspension linkage set forth in claim 33 wherein said at least one  
2                   key feature of said bolt includes at least one flat and said aperture of said second cam washer is  
3                   defined by at least one corresponding flat.

35.

1                   The automotive suspension linkage set forth in claim 34 wherein said at least one  
2                   flat includes at least two adjacent flats.

36.

1                   The automotive suspension linkage set forth in claim 35 wherein said at least two  
2                   adjacent flats includes an incomplete hexagon in cross section.

37.

1                   The automotive suspension linkage set forth in claim 36 wherein said incomplete  
2                   hexagon in cross section includes four of six sides.

38.

1        The automotive suspension linkage set forth in claim 28 wherein said at least one  
2        key feature of said bolt extends axially from said threaded portion for a length adapted to  
3        accommodate a variety of widths of said first and second members.

39.

1        The automotive suspension linkage set forth in claim 28 wherein said threaded  
2        portion of said bolt is diametrically smaller than said shank of said bolt to facilitate said second  
3        cam washer to pass freely thereover and engage said at least one key feature of said shank.